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Bacterial Wilt of Sweet Corn

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BACTERIAL WILT, sometimes known as Stewart's disease, has been present in Ohio for about 25 years, and since 1930 has become increasingly severe throughout the state. Before 1930 most sweet corn growers in northern Ohio had never seen wilt, and its ravages had been confined largely to the southern section of Ohio.

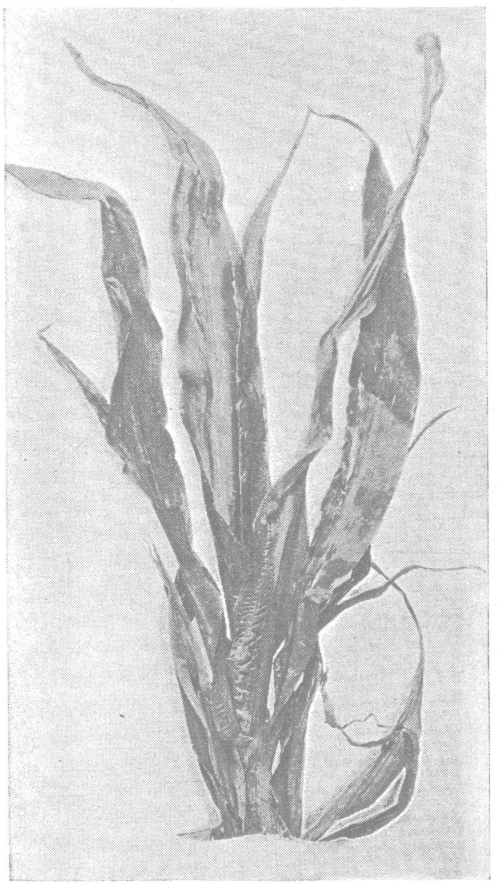

Fig. 1.—Young sweet corn plant showing characteristic leaf symptoms of bacterial wilt.

Now the disease is present throughout this state, and it has extended its northern range in many other states. During 1932 it was prevalent along Lake Erie as far north as Buffalo, was reported in southwestern Ontario, north in Michigan as far as Alpena, and found for the first time in Minnesota and Wisconsin. Whether the extremely low temperatures experienced this past winter will eradicate the disease from its recently invaded northern locations remains to be seen.

How to Know Wilt.—First look for stunted or wilted stalks. The leaf blades are frequently wrinkled, twisted, and otherwise malformed. In later stages severe tip-burn is in evidence on many leaves (see Fig. 1). Plants infected early in the season may not reach a height of over 6 to 8 inches before they wilt and

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dry up. Many plants show serious wilting from the time they are 2 feet tall to about tasseling time.

If the stem is cut across in a slanting manner the water conducting vessels, or bundles in the pith, will be yellowish in color instead of the normal white. Dark brownish to black tissue in various stages of decay will be found on the inside at the base of the stalk (see Fig. 3). The earliest roots will be rotted away and the region from the kernel to the first node will appear black and shriveled (see Fig. 2).

Where Does It Come From?—The bacterium[1] causing the wilt disease has been isolated from soil and corn stubble overwintering out of doors. Insects like the western corn root worm and white grubs feeding on the roots produce wounds through which the wilt organism may enter the plant. At first the bacteria are found concentrated in the xylem (water conducting vessels), but later spread to other tissues, and at that stage may be found in all parts of the plant, including the cobs and kernels of corn.

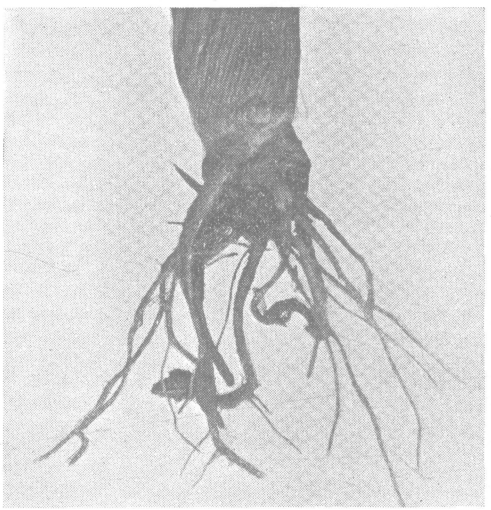

Fig. 2.—Decay of roots on corn plant infected by bacterial wilt.

Also, it is definitely established that infected seed may produce the disease. Seed has been found to vary in the percentage of infection from zero to 35 per cent. The bacteria are carried on the inside as well as on the surface of the seed.

If 1 to 2 per cent of the plants are infected in the early seedling stage, the entire crop may be ruined by harvest time if the variety is very susceptible. This secondary spread is brought about primarily by insects. Two species of flea-beetles[2] have been definitely proven to spread the disease in the field. Field observations indicate that the chinch bug, the twelve spotted cucumber beetle, and thrip should be added to the list of suspects. Regardless of which insects spread the disease, growers and scientists are agreed that it may spread very rapidly when all factors are favorable.

Is Seed Treatment of Value?—This is a logical question when one source of primary infection is in the seed. Unfortunately, no treatment has been devised which will kill all the bacteria within the seed and not kill the seed or greatly impair it. Investigators have been working on such a treatment, but have not yet succeeded. Soaking the seed in formaldehyde 1 part to 160 parts of water for 3 hours will reduce seed infection to a trace, but the plants

[1] *Aplanobacter stewarti.*

[2] *Choetocnema pulicaria* and *C. denticulata.*

showing signs of the disease just after emergence should be promptly rogued out and carried from the field. If this is not done, insects will soon spread the trouble, and the value of seed treatment will be largely lost.

If growers do not wish to use the formaldehyde treatment, they will benefit by treating their early planted seed with either Semesan Jr., or Barbak 111. This treatment will not control bacterial wilt, but will aid in preventing seed and seedling rots, and promote stronger plants which will more quickly advance beyond the extremely susceptible seedling stage. This treatment will cost only a few cents per acre for materials; directions on the label should be followed.

Varieties Vary in Susceptibility.—The early varieties of sweet corn, especially the Golden Bantam sorts, are most susceptible. This makes the disease of particular importance to the market gardener. Later sorts of sweet corn, such as Country Gentleman, or Stowell's Evergreen, while susceptible to the disease, are not severely attacked. Adams' Early and Ideal Early are resistant to bacterial wilt, and produce early corn, but are not true sweet corn varieties.

From 10 to 100 per cent infection has been reported for popcorn and flint corn. The writer has seen several garden patches of popcorn in western Ohio almost completely ruined by bacterial wilt. In Illinois, infected stalks were found in practically all of 66 fields of dent corn examined in 1932. The average infection was 6.2 per cent.

Secondary infections, consisting of elongated yellowish leaf lesions, were found on nearly every plant in these fields, and the loss of green leaf area averaged 16.6 per cent. However, bacterial wilt is not expected to become a major disease of field corn.

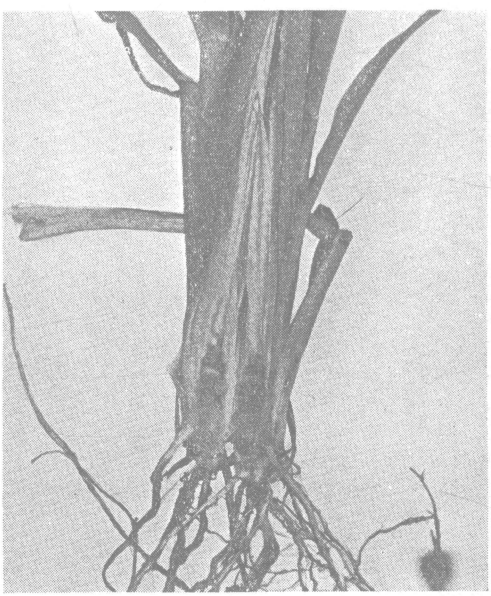

Fig. 3.—Discoloration produced on the interior of corn plant at the base of the stalk.

Control Recommendations

In former years, the use of Northern grown sweet corn was advised, and this procedure was apparently successful. Since 1930 this control measure has not met with success in many cases, probably because the organism became established in our soils. In some sections, Northern grown seed may still be used, if it is planted on soil which has not grown corn for a period of 3 or 4 years, and if wilt has not been serious in the community.

As previously noted, seed treatment will not kill all the bacteria causing this trouble without injuring germination. The most practical control remaining is the use of varieties resistant to the disease.

Golden Cross Bantam is a new "single-cross" hybrid sweet corn of high quality both for roasting ears and for canning purposes. It is high-yielding and resistant to bacterial wilt. This hybrid is 4 to 8 days later than Golden Bantam, has ears averaging about 8 inches in length, with 10-12 rows of light golden yellow kernels. Yield tests indicate that this hybrid will produce from 50 to 100 per cent more corn per acre than Golden Bantam, even in the absence of disease. When wilt is present the ordinary Bantam will many times be almost a total loss, while the Golden Cross Bantam will yield a good crop of roasting ears. It is not entirely immune, but yet is highly resistant to bacterial wilt.

Golden Cross Bantam is produced only from crossed seed obtained by controlled cross-pollination, usually in well-isolated breeding plots of two inbred lines, known as Purdue Bantam and Purdue 51[1]. This hybrid cannot be reproduced from its own seed. It is therefore desirable to purchase each year certified seed, grown in isolated crossing-plots under state supervision.

Seed cannot be saved with satisfaction from the commercial crop of Golden Cross Bantam, as such hybrids show their greatest vigor and disease resistance, the most uniformity, and yield to the full extent only in the first generation of the cross.

For resistant varieties there is a wide choice among the later maturing sorts. Country Gentleman, Bantam Evergreen, Narrow Grain Evergreen, Nonesuch, Black Sugar, Whipple's White or Yellow, or Stowell's Evergreen will be found sufficiently resistant to avoid commercial loss.

Plant breeders are developing new strains and hybrids resistant to this disease. From time to time such strains will be offered. It is well to check with the Extension Service or the Ohio Experiment Station as to the possible adaptation, quality, and resistance of these new strains and hybrids under the conditions where they are to be planted.

Development of resistant strains and hybrids now appears to offer the most satisfactory solution of the bacterial wilt problem with sweet corn. The one complicating feature is the probability of strains of the wilt organism developing, similar to those found in black stem rust of wheat. If such strains exist it will more than double the work of the plant breeder, and then it will be found that one variety or hybrid is resistant in one locality while susceptible in another. Other hybrids may be just the opposite in their resistance or susceptibility.

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[1] Detailed descriptions of the inbred lines, the cross, and the method of seed production may be found in Circular No. 268, March 1933, of the United States Department of Agriculture.